

पेटेंट कार्यालय  
शासकीय जर्नल

**OFFICIAL JOURNAL  
OF  
THE PATENT OFFICE**

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निर्गमन सं. 14/2026  
ISSUE NO. 14/2026

शुक्रवार  
**FRIDAY**

दिनांक: 03/04/2026  
DATE: 03/04/2026

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पेटेंट कार्यालय का एक प्रकाशन  
PUBLICATION OF THE PATENT OFFICE

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202611017613 A

(19) INDIA

(22) Date of filing of Application :17/02/2026

(43) Publication Date : 03/04/2026

(54) Title of the invention : RARE EARTH IONS DOPED NANOMATERIAL FOR SOLID STATE DEVICES

(51) International classification	:C01G 31/00, C01F 17/00, C09K 11/77, C09K 11/78, C09K 11/80	(71)Name of Applicant : <b>1)Dr. Jitendra Pal Singh</b> Address of Applicant :Assistant Professor, Department of Physics, School of Sciences, IFTM University, Moradabad, Uttar Pradesh, 244102 Uttar Pradesh India <b>2)Dr. Sudha Pal</b> <b>3)Prof. Yogesh Kumar Sharma</b>
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(32) Priority Date	:NA	
(33) Name of priority country	:NA	
(86) International Application No	:	
Filing Date	:01/01/1900	
(87) International Publication No	: NA	
(61) Patent of Addition to Application Number	:NA	
Filing Date	:NA	
(62) Divisional to Application Number	:NA	
Filing Date	:NA	

(57) Abstract :

The present invention relates to rare earth ions doped nanomaterials and their application in solid state devices. The invention provides inorganic nanocrystalline host materials including metal oxides, fluorides, phosphates, vanadates, and aluminium garnets doped with one or more rare earth elements selected from lanthanide series, particularly praseodymium (Pr<sup>3+</sup>) and neodymium (Nd<sup>3+</sup>) ions. The nanomaterials are synthesized using controlled methods including sol-gel, co-precipitation, hydrothermal, and combustion synthesis, yielding nanoparticles with mean crystallite sizes ranging from 5 to 100 nm. Rare earth doping alters crystallographic phase, morphology, and size of host, enabling tunable optical responses including photoluminescence, up-conversion and down-conversion luminescence, and near-infrared emission. The doped nanomaterials find application in solid state devices including light emitting diodes, solid state lasers, display systems, sensors, photovoltaic cells, bio-imaging, and medical diagnostics. The invention enables cost-effective, energy-efficient, and environmentally benign nanophosphor materials with superior quantum efficiency and spectral tunability for next-generation solid state device applications.

No. of Pages : 17 No. of Claims : 10